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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/713,013	11/17/2003	Motoki Numata	245309US0X CONT	9740
22850 7590 09/22/2009 OBLON, SPIVAK, MCCLELLAND MAIER & NEUSTADT, L.L.P. 1940 DUKE STREET ALEXANDRIA, VA 22314				
EXAMINER KUNEMUND, ROBERT M				
ART UNIT 1792		PAPER NUMBER		
NOTIFICATION DATE 09/22/2009		DELIVERY MODE ELECTRONIC		

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UNITED STATES PATENT AND TRADEMARK OFFICE

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BEFORE THE BOARD OF PATENT APPEALS  
AND INTERFERENCES

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*Ex parte* MOTOKI NUMATA, TOSHIYA IWASAKI,  
KATSUNORI FUKUDA, TAKAYUKI ISOGAI, and KATSUYA ANDO

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Appeal 2009-005846  
Application 10/713,013  
Technology Center 1700

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Decided: September 18, 2009

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Before JAMES T. MOORE, *Vice Chief Administrative Patent Judge*,  
TERRY J. OWENS, and PETER F. KRATZ, *Administrative Patent Judges*.

KRATZ, *Administrative Patent Judge*.

DECISION ON APPEAL

This is a decision on an appeal under 35 U.S.C. § 134 from the Examiner's final rejection of claims 25-49. We have jurisdiction pursuant to 35 U.S.C. § 6. Oral arguments were presented on August 11, 2009.

Appellants' claimed invention is directed to a method of producing a compound, such as terephthalic acid (an aromatic carboxylic acid), wherein a cake with attached liquid is subjected to a drying step that is characterized by moving the cake with attached liquid to a reduced pressure compound recovery zone for evaporation of the attached liquid. Internal energy released upon movement into the reduced pressure zone is employed in the evaporative drying step ("flashing"). The drying is conducted so as to reduce the attached liquid to no more than 10 weight percent based on the solid content of the cake.

Claim 25 is illustrative and reproduced below:

25. A process for producing a compound comprising:

(A) introducing a substrate and a reaction medium into a reactor at a pressure higher than atmospheric pressure and at a temperature at least equal to the boiling point at atmospheric pressure of the reaction medium for a time and under conditions suitable to form said compound in the form of a slurry containing the compound and the reaction medium;

(B) separating at least some of the reaction medium from said slurry at a pressure higher than atmospheric pressure and at a temperature at least equal to the boiling point at atmospheric pressure of the reaction medium to obtain a cake having a weight ratio of a cake-attached liquid of not more than 50% based on the solids content; and

(C) drying the resulting cake by moving it into a compound recovery zone under conditions in which the internal energy released by the movement of the compound into the compound recovery zone evaporates the cake-attached liquid, said conditions comprising moving the compound into a compound recovery zone having a pressure lower than the pressure in (B);

wherein in the drying step (C), a weight ratio of the cake-attached liquid is not more than 10 % based on the solids content.

The Examiner relies on the following prior art references as evidence in rejecting the appealed claims:

Turner	6,307,099 B1	Oct. 23, 2001
Beard	WO 00/71226	Nov. 30, 2000

The Examiner maintains the following grounds of rejection:

Claims 25 through 49 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Turner in view of Beard. We note that the Examiner divided the rejected claims between two separately presented obviousness rejections over the aforementioned references, which we have consolidated into the single statement above (*see* Ans. 3-4).

We affirm the stated rejection. Our reasoning follows.

At the outset we note that Appellants state that they argue several dependent claims separately in separate sub-groupings. However, the argument presented only refers to dependent claims 27-29 (App. Br. 12, and 13). Accordingly, we regroup claims 30 and 39-49 together with claims 25, 26, and 30-38, which commonly rejected claims Appellants do not separately argue with reasonable specificity in the Appeal Brief.

In sum, we select sole independent claim 25 as a representative claim on which we shall primarily focus in deciding this appeal with respect to commonly rejected claims 25, 26, and 30-49. We consider dependent claims 27-29 separately to the extent that they are separately argued (App. Br. 12-13).

Appellants contend that the combined teachings of Turner and Beard would not have suggested using a depressurization step together with the internal heat of a product cake and attached liquid for drying the product

cake to an extent such that no more than 10 weight percent of attached liquid remains, a result which is argued as not being expected (App. Br. 9-11).

### PRINCIPAL ISSUE

Have Appellants established reversible error in the Examiner's obviousness rejection by asserting that the claimed depressurization drying step would not have been suggested by the combined teachings of Turner and Beard, to one of ordinary skill in the art, with a reasonable expectation of success in depressurization drying a cake using released internal energy so that attached liquid is no more than 10 weight percent of the cake, and/or by arguing that the claimed drying is attended by unexpected results?

### PRINCIPLES OF LAW

On appeal to this Board, Appellant must show that the Examiner erred in finally rejecting the claims. *Cf. In re Kahn*, 441 F.3d 977, 985-86 (Fed. Cir. 2006); *see also* 37 C.F.R. § 41.37(c)(1)(vii).

A claimed invention is not patentable if the subject matter of the claimed invention would have been obvious to a person having ordinary skill in the art. 35 U.S.C. § 103(a); *KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 406 (2007); *Graham v. John Deere Co. of Kansas City*, 383 U.S. 1, 17 (1966).

The Supreme Court has instructed that although the teaching, suggestion, and motivation test “captured a helpful insight,” an obviousness analysis “need not seek out precise teachings directed to the specific subject matter of the challenged claim, for a court can take account of the inferences

and creative steps that a person of ordinary skill in the art would employ.”  
*KSR*, 550 U.S. at 418.

“The combination of familiar elements according to known methods is likely to be obvious when it does no more than yield predictable results.”  
*KSR*, 550 U.S. at 415-16. The question to be asked is “whether the improvement is more than the predictable use of prior art elements according to their established functions.” *KSR*, 550 U.S. at 417.

The Federal Circuit emphasized that “[a]n obviousness determination is not the result of a rigid formula disassociated from the consideration of the facts of a case. Indeed, the common sense of those skilled in the art demonstrates why some combinations would have been obvious where others would not.” *Leapfrog Enter., Inc. v. Fisher-Price, Inc.*, 485 F.3d 1157, 1161 (Fed. Cir. 2007).

A rejection premised upon a proper combination of references cannot be overcome by attacking the references individually. *In re Keller*, 642 F.2d 413, 425-26 (CCPA 1981).

## FINDINGS OF FACT

The Examiner has found that Turner teaches or suggests a method of making terephthalic acid employing reaction temperatures and elevated pressures corresponding to Appellants’ claimed temperature and pressure requirements (Ans. 3; *see, e.g.*, Turner, col. 5, ll. 35-45, col. 8, ll. 11-21; Spec., para. bridging pp. 10-11 and p. 32). Appellants do not dispute these findings of the Examiner (*see generally* App. Br.).

The Examiner has found that a resultant terephthalic acid-containing slurry product of Turner is subjected to a separation step to form a cake and

the cake is subjecting to drying (Ans. 3). Hence, the Examiner has found that the terephthalic acid synthesis method of Turner substantially corresponds to the method of representative claim 25 but for Appellants' specified drying step (*id.*). Appellants do not particularly dispute these findings of the Examiner (*see generally* App. Br.).

Significantly, Appellants correctly acknowledge that Turner mentions (discloses) drying via "flashing off" solvent and transferring a filter cake to a low pressure zone for drying (Reply Br. 2; Turner, col. 12, ll. 30-36, col. 13, ll. 34-42, and col. 14, ll. 21-23). Turner discloses that the solvent can comprise acetic acid (col. 2, l. 51 - col. 3, l. 26).

The Examiner has found that Beard teaches or suggests employing pressure reduction to dry a similar terephthalic acid product. In this regard, Beard teaches that product cake can be passed to a reduced pressure depressurization chamber to remove residual liquid as vapors (Ans. 3 and 4).

In this regard, we emphasize that Beard discloses that:

[t]he term "solid phase material" means the material that is separated from that slurry by the filter media 8, such as a "cake" that is deposited on that filter media. The solid phase material may also contain substantial liquid, such as, for example, liquid that is not separated from the solid phase material and/or washing fluid. The temperature of the solid phase material can be greater than the atmospheric boiling point of the liquid contained in that material. For such hot material, when that material is rapidly decompressed, or flashed, the liquid rapidly vaporizes as the pressure, or pressure and temperature, are lowered. For example, when a pressurized solid phase material, that contains water and has a temperature greater than 212°F, is rapidly depressurized to atmospheric pressure, the water in that material will rapidly vaporize to form vapor.

Beard, pp. 7-8.

In addition, Beard teaches:

[a] material transport continuously moves solid phase material from the solids outlet of the filtration unit to a depressurizing chamber. The depressurizing chamber has a lower pressure than the filtration unit to facilitate subsequent processing of that material. As the solid phase material is transported into the depressurizing chamber, that material is directly and rapidly depressurized to the lower pressure of that chamber. Advantageously, the rapid depressurization can cause "flashing" of the solid phase material, which removes residual liquid, gas and volatile substances from that material.

Beard, p. 4.

Moreover, Beard discloses or suggests that the cake can be washed with a washing fluid (liquid water), before forwarding the cake for a depressurization/dewatering step wherein the pressure is such that the temperature of the cake liquid (water) is above 212 degree Fahrenheit (pp. 3 and 8 -10).

Appellants disclose that the pressure drying device employed in their process "is not particularly limited" (Spec. 20). Appellants disclose that the depressurization dried cake can be subjected to further drying (Spec., para. bridging pp. 26-27). Appellants disclose or suggest that the reaction medium and the cake washing liquid can comprise, for example, acetic acid and acid acid/water mixtures (Spec., para. bridging pp. 30-31, para. bridging pp. 36-37).

Appellants present a comparison Example 1 in the Specification wherein terephthalic is prepared using air as an oxygen source, p-xylene, acetic acid, and a specified catalyst, which materials were fed to a reactor wherein a reaction was conducted under specified pressure, temperature, and



residence time conditions in this reactor and a subsequent reactor (Spec., Comp. Ex. 1, pp. 39-41). After specified intermediate processing, the resultant cake product was dried in a steam tube dryer (*id.*). Also, the Specification presents three Examples wherein flash separation was said to have been employed for drying a cake (Spec., Exs. 1-3, pp. 41-46).

The Specification does not identify the three Examples as demonstrating unexpected results for the claimed process (*id.*). The Specification states that “the invention is never limited to these Examples unless exceeding the gist of the invention” (Spec., para. bridging pp. 38-39).

## ANALYSIS

Claims 25, 26, 30-49

Appellants argue that the combined teachings of Turner and Beard do not teach or suggest with a reasonable expectation of success that employing a flash-type depressurizing chamber/step as taught by Beard for drying the cake, including terephthalic acid of Turner, would have led one of ordinary skill in the art to depressurize the cake (using released internal energy) such that the liquid removal would result in a cake that is dried to the extent Appellants’ representative claim 25 requires; that is, that the cake-attached liquid remaining is no more than 10 weight percent of the cake solid content.

We disagree. Appellants have not substantiated their argument with persuasive evidence establishing that one of ordinary skill in the art would not have reasonably been expected to arrive at a cake dryness level, as called for in claim 25, upon routine experimentation in determining the workable limits for conducting the evaporative pressure letdown drying step following a filtering step to form the cake, as taught as an option by the applied prior

art. As we noted above, Turner teaches or suggests employing high reaction pressures, reaction temperatures and reaction mediums like Appellants.

Also and as we found above, both Turner and Beard disclose that pressure reduction/flashings can be used to remove liquid from the filter cake product. Moreover, Turner and Beard, like Appellants, are interested in obtaining a relatively dry product terephthalic acid, as indicated by the drying steps taught and/or suggested therein. Additionally, Appellants have not substantiated that the movement of the cake to a lower pressure zone during evaporative “flash” drying (removal of liquid), as taught by Turner and Beard, would not naturally be expected to involve “internal energy released by the movement” as broadly called for in representative claim 25.

While we recognize that Appellants urge that both Beard and Turner teach that their cakes can be subjected to further drying following liquid removal via pressure letdown, we agree with the Examiner that Appellants’ Specification discloses that additional drying of the cake can take place and Appellants’ representative claim 25 does not exclude an additional drying step following the pressure reduction drying step (App. Br. 9; Ans. 4). Consequently, it is manifest that this line of argument fails to show reversible error in the Examiner’s obviousness rejection.

Finally, Appellants urge that a “greater than expected dryness through a depressurization step” is obtained by the named inventors (App. Br. 11 and 12). However, Appellants have not established unexpected results for the claimed process based on the arguments furnished in the Appeal Brief and the briefly referenced Specification Examples. While Tables 1 and 2 and Examples 1-3 of the Specification are referenced as supporting this assertion, Appellants have not fairly explained how comparative Example 1

of the Specification is representative of the closest prior art because that comparison example does not employ flash drying at all whereas both Turner and Beard do so. Furthermore, Appellants have not explained how Examples 1-3 of the Specification are reasonably commensurate in scope with representative claim 25. Nor have Appellants detailed how the showings evidence results that are more than what would have been expected for a flash drying operation, as urged by the Examiner (Ans. 5).

On this appeal record, we shall sustain the Examiner's obviousness rejection of representative claim 25.

#### Claims 27-29

Concerning dependent claims 27-29, Appellants additionally argue that the applied prior art does not describe, much less indicate optimizing, the "washing steps of claims 27 or 29 or the reaction medium parameters of claim 28" (App. Br. 12-13). These arguments are unpersuasive in establishing reversible error in the Examiner's obviousness rejection.

In this regard, Appellants have not explained why the washing liquids and/or reaction medium taught or suggested by the combination of Turner and Beard would not have been expected to possess the recited evaporation latent heat requirements set forth in claim 27 or claim 28, respectively. For example, Appellants have not explained how Turner alone or together with Beard would not have suggested making terephthalic acid using reactants, including a reaction medium, corresponding to Appellants' reaction medium.

We note that Appellants have not identified any compositional differences in their reaction medium that would account for a patentable

difference in an evaporation latent heat property thereof compared to that expected for the correspondingly similar reaction medium of Turner.

As for the argued washing step requirements of claim 29 (or claim 27), Beard teaches cake can be washed with a washing fluid (liquid water) before forwarding the cake for a depressurization/dewatering step, as we set forth above (Beard, pp. 3 and 8 -10). Given that the pressure of the cake has not yet been reduced when washing is conducted according to Beard, Appellants have not reasonably explained why one of ordinary skill in the art would have avoided using a washing medium, such as water, at a temperature above the boiling point (212 degree Fahrenheit) at the elevated pressure location where the washing is conducted.

Indeed, one of ordinary skill in the art would have readily recognized the advantages of using an elevated washing temperature so as to avoid cooling the, as yet, unexpanded cake liquids to facilitate the flashing taught by the applied references.

## CONCLUSION

Appellants have not established reversible error in the Examiner's obviousness rejection by the attorney argument asserting that the claimed depressurization drying step would not have been suggested by the combined teachings of Turner and Beard to one of ordinary skill in the art with a reasonable expectation of success in depressurization drying of a cake using released internal energy so that attached liquid is no more than 10 weight percent of the cake, and/or by asserting that the claimed drying is attended by unexpected results.

ORDER

The Examiner's decision to reject claims 25 through 49 under 35 U.S.C. § 103(a) as being unpatentable over Turner in view of Beard is affirmed.

No time period for taking any subsequent action in connection with this appeal may be extended under 37 CFR § 1.136(a)(1)(v).

AFFIRMED

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